

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a semiconductor substrate, having a main surface, in which first and second trenches are formed in said main surface at a distance away from each other;

5 first and second isolation insulating films filling in said first and second trenches;

a gate insulating film, formed on said main surface located between said first isolation insulating film and said second isolation insulating film, including silicon, having an end portion in a birds beak form which brings
10 into contact with said first isolation insulating film and said second isolation insulating film, respectively; and

a silicon film formed on said gate insulating film, having a thickness exceeding 0 and being less than 50 nm in an intermediate portion between said first isolation insulating film and said second isolation insulating film,
15 and being thinner than said thickness on said end portion.

2. The semiconductor device according to claim 1, further comprising

a conductive film, including silicon, located on and connected to said silicon film.

3. The semiconductor device according to claim 2, wherein each of said first and second isolation insulating films and has a second top surface, and the distance from said main surface to said second top surface is at least 20nm.

4. The semiconductor device according to claim 2, wherein each of said first and second isolation insulating films has a second top surface, and the distance from said main surface to said second top surface is at least the sum of the thickness of said gate insulating film and
5 said silicon film.

5. The semiconductor device according to claim 2, wherein the thickness of said conductive film is at least 50nm and at most 200nm.
6. The semiconductor device according to claim 2, wherein each of said first and second isolation insulating films has a second top surface, and said conductive film is formed to cover at least part of said second top surface.
7. The semiconductor device according to claim 1, wherein said gate insulating film has a first top surface, each of said first and second isolation insulating films has a second top surface, and the distance from said main surface to said second top surface is greater than the
5 distance from said main surface to said first top surface.
8. The semiconductor device according to claim 1, wherein said silicon film includes phosphorus.
9. The semiconductor device according to claim 1, further comprising
sidewall insulating films, having surfaces being continuous with the portions of said semiconductor substrate defining the side faces of said first
5 and second trenches, formed so as to bring into contact with the sidewalls of said silicon film and said gate insulating film.